

# West Nile Virus Maricopa County 2003 & 2004

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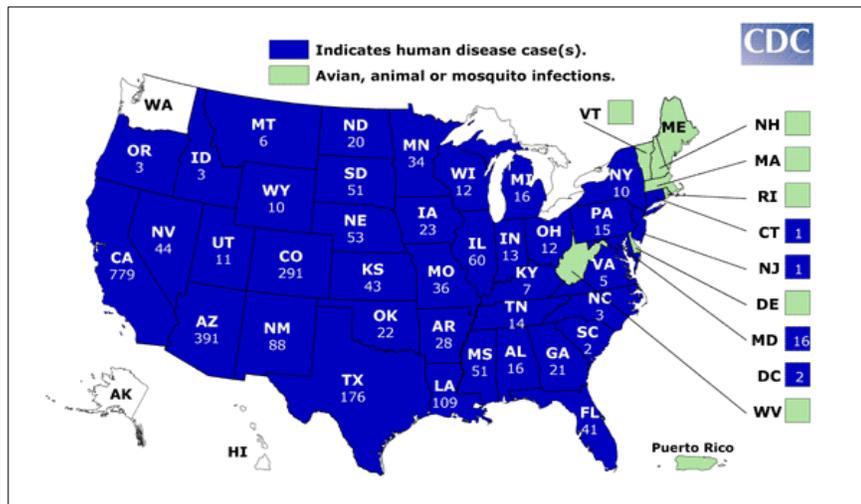
The following report on WNV activity in Maricopa County will describe the major local events as well as issues of national interest during 2003-2004.

## 2003 & 2004 Overview

The nationwide seasonal outbreak of West Nile virus (WNV) and its westward migration which began in 1999, reached its peak in 2003 with 9862 human cases and 264 deaths in the United States.

During 2003, many Midwestern states and our border state of Colorado experienced a massive epidemic/epizootic of WNV. Colorado, Nebraska, Texas and the Dakotas accounted for more than one-half of all human WNV-related illnesses reported nationwide. East coast states with traditionally high seasonal WNV activity had a relatively quiet year. (Figure 1)

In 2003, WNV also made its expected appearance within Arizona borders. The virus rapidly spread across the state from rural southeastern and northeastern niches into suburban and fringe areas of Maricopa County. Confirmed WNV activity permeated every facet of surveillance including human cases of meningoencephalitis.



## 2003 West Nile Virus Season

### **Major National WNV Issues in 2003**

#### Impact of Commercial Laboratories

For the first time in 2003, commercial laboratories participated significantly in the screening of human specimens for WNV. Two Food and Drug Administration (FDA) test kits newly approved for WNV antibody screening were widely used, the IgM Capture Elisa FOCUS kit and the PanBio WNV IgM Assay.



The availability of commercial WNV test kits has changed the scope of WNV human surveillance. Ready access to laboratory testing has increased the number of non-neuroinvasive disease cases reported. For example, 69% of WNV-related illnesses reported in 2003 were attributed to West Nile Fever (WNF), a less severe form of WNV infection without neurological complications, compared to only 21% in 2002 (<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5150a1.htm> and [http://www.cdc.gov/ncidod/dvbid/westnile/surv&controlCaseCount03\\_detailed.htm](http://www.cdc.gov/ncidod/dvbid/westnile/surv&controlCaseCount03_detailed.htm)). These additional data have the potential to aid in monitoring the progression of the disease and documenting its natural history.

#### Blood Donor Surveillance

As a direct result of 23 confirmed transfusion-related WNV infections in 2002, an experimental screening method was developed and given investigational new drug status by the FDA for implementation in June of 2003. The new WNV testing methodology is a nucleic acid amplification test which measures viral DNA. The WNV donor screening method employs the same "mini-pool" format as screening protocols for Hepatitis B and C viruses, and the Human Immunodeficiency virus in which multiple samples (6 or 16) are tested together as a pool. Negative pools continue through the blood banking process and are subsequently administered to patients. Positive pools are retested by their specific components to identify the infected sample which is traced back to the individual donor, all blood products from the infected donor are removed from the system.

Testing and reporting participants included all major U.S. blood service agencies and the Department of Defense, which accounted for 90-95% of all U.S. donations. In 2003, over 6.2 million donations were screened and 1027 presumptive viremic donors were identified; none were residents of Arizona.

#### Pregnancy Registry: Outcomes of WNV infection in Pregnancy

A national registry has been implemented by the Centers for Disease Control & Prevention (CDC) to gather information on the outcomes of pregnancies complicated by WNV infection. Placental, umbilical cord, cord blood and/or breast milk samples were sought for each of 72 women reported to the registry in 2003. At the time this information was released, 42 live births from this cohort had occurred [http://www.cdc.gov/ncidod/dvbid/westnile/conf/pdf/OLeary\\_2\\_04.pdf](http://www.cdc.gov/ncidod/dvbid/westnile/conf/pdf/OLeary_2_04.pdf).

In 28 of the 42 live births, no abnormality has been detected. Three birth outcomes are unknown. Major abnormalities were identified in five births: Downs' Syndrome (1), lissencephaly, microcephaly (2), and cleft palate (1) were detected. Minor abnormalities were detected in four births: Rash (3) and skin tags (1). Three infants were born prematurely. A single infant had acquired WNV infection that could be linked to intrauterine transmission but no apparent illness. Because of these findings, CDC officials met with a national group of specialists in congenital disorders in December 2003 to develop guidelines for the evaluation of infants born to mothers who acquired WNV infections during pregnancy. These guidelines can be found on the worldwide web at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5307a4.htm>.



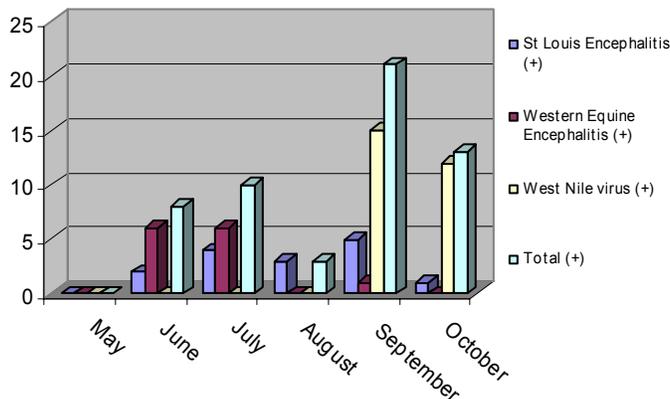
## WNV in Maricopa County 2003

### Mosquito Pools

The first evidence of WNV in Arizona was a positive mosquito pool in Cochise County in early August. A WNV positive dead bird preceded the first Maricopa County WNV positive mosquito pool in September by less than one week. Ultimately, in Maricopa County there were 27 WNV positive pools from 478 mosquito pools sampled during the WNV season, which began on May 1, 2003, and ended on November 30, 2003. WNV mosquito activity peaked during the month of September. (Figure 3)

Figure 3

Arbovirus Positive Mosquito Pools by Month, Maricopa County, 2003



### Equines

A total of 130 equines were confirmed to have WNV-related illness statewide in 2003. In Maricopa County, 24 equine illnesses were reported. The initial animal, a 25-year-old mule, located in the city of Gilbert, was believed to have been infected during early September. One week after the discovery of the infection the mule was euthanized.



### Dead Bird Surveillance

Avian mortality was the first indicator of WNV activity within Maricopa County in 2003. The specimen, a sparrow, was found in the city of Chandler on September 11, 2003. A total of 26 WNV positive birds were identified. Sentinel varieties of avian species were reported but sparrows accounted for more than half of the WNV positive species.

### Sentinel Chicken Flocks

Sentinel chicken flocks in North Phoenix, Gilbert, Mesa and Peoria reported WNV positives. All chicken flock positives occurred after the mosquito and bird indicators.

## Human Surveillance

Enhanced surveillance for WNV-human illness began May 1, 2003. In addition to all cases of meningitis and encephalitis reported due to WNV-infection, a broader set of criteria, listed in *Figure 4*, were used to assist in the process of screening all viral neurologic diseases for WNV and Saint Louis Encephalitis (SLE).

During the 2003 season, 13 human WNV-related illnesses were reported and confirmed in Arizona, 10 of which occurred in Maricopa County residents. Eight cases were classified as West Nile neuro-invasive disease (WNND) and 2 as West Nile fever (WNF). With the exception of one case (onset Nov 1, 2003), all exposures to WNV occurred outside of Maricopa County. WNV positive surveillance indicators were few therefore all human suspect blood and cerebral spinal fluid (CSF) samples were confirmed by CDC and careful histories obtained to determine the exact WNV exposure location.

Figure 4

Criteria for Enhanced Surveillance Human WNV Disease, 2003 Season	
✓	All cases of viral <b>encephalitis</b> or
✓	Hospitalized cases of <b>aseptic/viral meningitis</b> and:
•	>Age 30 and or,
•	Altered mentation and or,
•	Profound muscle weakness and or,
•	Neuropathic symptoms (at least one of the following):
◇	Flaccid paralysis
◇	Spastic paralysis
◇	Guillain-Barré Syndrome
◇	Seizure

## Aseptic Meningitis Outbreak During the WNV Season

In March 2003, a significant increase in expected aseptic meningitis reports from local health care institutions was noted. The outbreak peaked in August 2003 with a tenfold increase in reported aseptic meningitis cases, *Figure 5*. An investigation revealed the Enterovirus Echovirus 30 to be the primary cause of the epidemic, which also affected several other states in our region. Although the majority of aseptic meningitis cases were among 4-15 year olds (more than one third of total) the number of adults fitting the age criteria for WNV/SLE screening increased by 55% as a result of the Echo 30 outbreak (*Figure 5* and 6).

Figure 5

## Aseptic Meningitis Epidemic

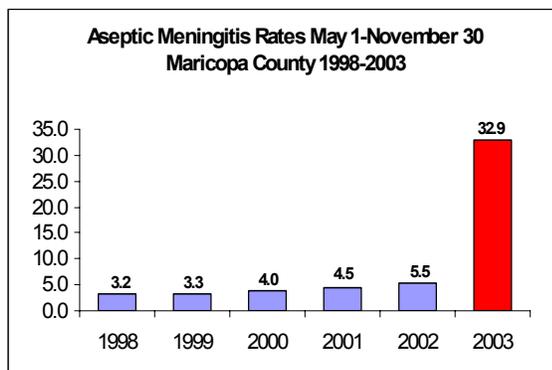


Figure 6

Results of Enhanced Surveillance: Viral Meningitis and Encephalitis Cases, n=91	
Etiology	# of Cases
Arbovirus negative (etiology unknown)	55
St. Louis Encephalitis (SLE)	2
Confirmed/suspect Enterovirus infection	10
Herpes Simplex Virus (HSV)	3
HIV-related/Cocci	3
Other CNS condition	7
Rule out (non-CNS condition)	5
Refused screening	4
Lost to follow-up	2



## West Nile Virus in Maricopa County 2004

Although nationally reported cases of WNV-related illness decreased in 2004, western states still felt the burden of this disease. Arizona (391) and California (760) accounted for 47% of all cases nationwide. Of the 391 cases in Arizona, 355 (91%) occurred in Maricopa County. In Maricopa County, viral circulation began early in the season with the first case with an onset of May 2.

During the season, widespread transmission of WNV occurred within Maricopa County for the first time, while sporadic cases were identified among other AZ counties, *Figure 7*.

Figure 7

Arizona Counties Reporting		
County	# WNV Human cases (Deaths)	Rate/100,000
Apache	5	7.50
Cochise	1	0.85
Gila	1	1.95
Graham	4	12.00
Maricopa	355 (14)	11.56
Mohave	6	3.87
Navajo	1 (1)	1.02
Pima	7 (1)	0.83
Pinal	9	5.00
Yavapai	1	0.60
Yuma	1	0.63
Data from ADHS, 2005		

*Figure 8*, illustrates veterinary and mosquito surveillance indicators for Arizona and Maricopa County.

Figure 8

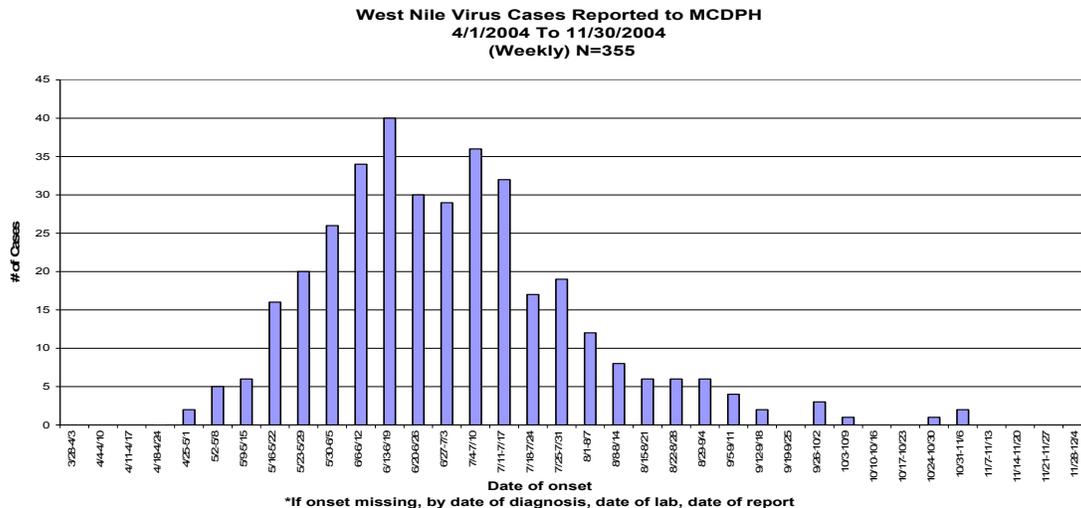
WNV Surveillance Indicators: Arizona and Maricopa County, 2004		
Surveillance Indicator	Arizona	Maricopa County
*Mosquito pools	250	101
**Sentinel Chickens	50	28
Equines	109	55
Dead Birds	98	52
Other animals	5 (4 tree squirrels, 1 alpaca)	1 (alpaca)
* 31 also tested positive for SLE or WEE		
** The flocks did seroconvert to WEE and SLE as well.		



## Human Surveillance, 2004

Enhanced surveillance for WNV-related human illness began April 1, 2004, one month earlier than in the preceding year. The case criteria for enhanced surveillance was modified to include patients 40 years of age or greater. Human case reports peaked in mid June (see *Figure 9*) and tapered significantly by August, the usual peak of arbovirus activity in South Central Arizona.

Figure 9



In all, over 1100 case investigations were performed resulting in the identification of 355 WNV-related illnesses and 14 WNV-related deaths. The age range for all cases was 0 to 91 years with an average age of 58.8 years old.

The case classification was used for local surveillance purposes only, and differs from the case definition applied by state and federal officials for national reporting. The difference in the proportion of neuro-invasive disease cases between Arizona and Maricopa County is the result of a modified case definition criteria by Maricopa County in effort to assess the true impact of Maricopa County's first WNV outbreak.

### Viremic Donors

Per national reporting criteria, viremic donors who did not become symptomatic were not included in case numbers. In Maricopa County, 36 viremic blood donors were identified through the blood screening program. Of these, 14 (39%), did not suffer a WNV-related illness.

The prevalence of WNV infection among the general population of donors in Maricopa County can be estimated (based on a partial count of 79,850 donations statewide

between May — October 2004), at 39 infected persons per 100, 000. This is a close approximation to the population prevalence of WNV in donors in Maricopa County since the majority of blood donors reside within our county. This is an estimate only because data for the exact number of blood product donations in Arizona is available for only one donor agency and county level data is not available.

Figure 10

2004 WNV Season Maricopa County					
Case Classification	Male	Female	Cases	%	Deaths
Encephalitis	69	46	115	32%	11
Meningitis	58	61	119	34%	-
Viremic Donor Encephalitis	2	-	2	1%	-
Viremic Donor Meningitis	-	4	4	1%	-
Neuroinvasive Disease-Cumulative	129	111	240	68%	11
Fever	47	51	98	28%	1
Viremic Donor Fever	10	6	16	5%	-
Fever-Cumulative	57	57	114	32%	1
Unknown	0	1	1	0%	2
<b>TOTAL CUMULATIVE</b>	<b>186</b>	<b>169</b>	<b>355</b>	<b>100%</b>	<b>14</b>
Viremic Donor Asymptomatic	8	4	12	-	-



Human Surveillance, continued

Figures 11-13 illustrate 2004 WNV human disease data compared by age, gender, race and geography.

Figure 11

2004 Maricopa County West Nile Virus Gender & Race/Ethnicity Breakdown n=355														
Gender	AGE													Totals
	<1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 34	35 - 44	45 - 54	55 - 64	65 - 84	> 85	Unk.	
Male	3	1	2	1	6	8	20	28	31	41	43	2	-	186
Female	-	1	-	-	1	5	11	32	44	28	43	3	1	169
Unknown	-	-	-	-	-	-	-	-	-	-	-	-	-	0
<b>TOTAL GENDER</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>7</b>	<b>13</b>	<b>31</b>	<b>60</b>	<b>75</b>	<b>69</b>	<b>86</b>	<b>5</b>	<b>1</b>	<b>355</b>
Race/Ethnicity														Totals
African American (non-Hispanic)								1						1
American Indian (non-Hispanic)						1	2			2				5
Asian/Pacific Islander (non-Hispanic)							1	1			2			4
Hispanic	2				1	3	5	2	3	6	8			30
Other/Unknown (non-Hispanic)						1				1				2
White (non-Hispanic)		1	2	1	2	4	20	48	61	48	70	4	1	262
Unknown/Unknown	1	1			4	4	3	8	11	12	6	1		51
<b>TOTAL RACE/ETHNICITY</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>7</b>	<b>13</b>	<b>31</b>	<b>60</b>	<b>75</b>	<b>69</b>	<b>86</b>	<b>5</b>	<b>1</b>	<b>355</b>

Figure 12

City	# Cases	Population <sup>1</sup>	Rate / City <sup>2</sup>
Phoenix	129	1,416,055	9.11
Scottsdale	52	221,130	23.52
Mesa	46	447,130	10.29
Glendale	30	233,330	12.86
Chandler	29	220,705	13.14
Tempe	12	160,820	7.46
Gilbert	10	164,685	6.07
Peoria	10	132,300	7.56
Cities ≤5 cases	23	238,310	9.65
Other <sup>3</sup>	7	242,380	2.89
Unknown <sup>4</sup>	7		
<b>Maricopa County Total Cases</b>	<b>355</b>		
<b>TOTAL POPULATION<sup>5</sup></b>		<b>3,476,845</b>	

Notes:

<sup>1</sup> Population statistic obtained from Arizona Department of Economic Security, July 1, 2004

<sup>2</sup> Rate per 100,000 population = (N/population) X 100,000

<sup>3</sup> Unincorporated areas—Cashion, Higley, Laveen, New River, and Sun City

<sup>4</sup> Includes cases with city of residence information

<sup>5</sup> Total population represents only those cities that have reported cases

Figure 13

2004 MARICOPA COUNTY WEST NILE VIRUS Pediatrics (<18 y.o.) Gender - Age - Classification Frequency (N=11)									
AGE	MALE				FEMALE				GAC Total
	Meningitis	Encephalitis	Fever	Unclassified	Meningitis	Encephalitis	Fever	Unclassified	
0 - 4	2	1	1	-	-	1	-	-	5
5 - 12	1	1	1	-	-	-	-	-	3
13 - 17	-	2	1	-	-	-	-	-	3
<b>Totals</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>11</b>



Human Surveillance, continued

WNV in Pregnancy in 2004

A single case of WNV infection during pregnancy was identified in a Maricopa County resident. The patient is a 23 year old who became infected with WNV during the 2nd trimester of pregnancy. The patient was discharged after a 3-day hospital admission with a diagnosis of meningitis. In January, the patient delivered a full term infant. No abnormalities were described. No placental, umbilical cord, cord blood or breast milk samples were delivered to be tested.

Transfusion Associated Transmission <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5336a4.htm>

During the 2004 season, a single case of WNV-transfusion associated transmission (TAT) was identified in Maricopa County. The 43-year-old male patient (not a Maricopa County resident) was admitted to a Maricopa County hospital in July 2004 for a left leg amputation above the knee related to diabetes and sepsis. Following the procedure he was discharged in stable condition. On 7/29/04 he was admitted again and diagnosed with WNV-related encephalitis. The patient expired in Maricopa County on 8/20/2004. Review of the medical records revealed that the patient received a blood transfusion during the first hospitalization. The blood products were traced and tested reactive on an individual nucleic acid amplification testing. The donor subsequently sero-converted to WNV IgM reactivity. This case is considered a probable, not confirmed, WNV-transfusion associated transmission case since the possibility of mosquito transmission in the patient's county of residence or while visiting Maricopa County could not be entirely ruled out.

Paralysis Cases

During the 2002 season WNV-related poliomyelitis-like syndrome was first identified in patients in Mississippi and Louisiana (<http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5137a1.htm>).

This syndrome was further characterized in 2003 in 32 patients from Colorado as being associated with long term disability with measurable persistent neurocognitive abnormalities <http://www.cdc.gov/ncidod/dybid/westnile/conf/2005pdf/Sejvar2ndsess.pdf>. Seven similar cases were identified in Maricopa County during the 2004 season. No case definition for this syndrome existed at the time.

The criteria used for Maricopa County cases:

- 1-Laboratory confirmed WNV-infection AND
  - 2-Physician documented acute paralysis
- Figure 21 presents a summary of these data.

Figure 15

West Nile Virus-related Poliomyelitis-like Syndrome						
Age	Gender	Diagnosis	Duration of Paralysis	Status of Paralysis*	Location	Rehab. Days
45	F	Meningitis	15 days	recovered	Right Upper Extremity	0
72	M	Encephalitis	152 days	recovered	Bilateral Lower Extremity	0
58	M	Encephalitis Acute Transverse Myelitis	278 days	ongoing	Bilateral Lower Extremity	30
63	M	Encephalitis	306 days	ongoing	Bilateral Lower Extremity	30
67	M	Encephalitis	172 days	recovered	Bilateral Lower Extremity	84
66	M	Encephalitis	30 days	recovered	Generalized Paralysis	58
76	M	Encephalitis	327 days	ongoing	Generalized Paralysis	173

\*At six months follow-up post initial interview



## Human Surveillance, continued

### Mortality Surveillance:

During the 2004 season, 65 deaths from viral or suspected viral meningitis, encephalitis, or paralysis were investigated. These included deaths directly reported to the health department as well as those identified through matching of mortality and communicable disease databases. In each case, chart reviews, post-mortem testing of clinical specimens retained at healthcare facilities, and interviews with attending physicians and family members were required.

The total number of deaths determined to be WNV-related was 14. The average age among WNV-related deaths was 69 years (range of 51-82 years); there were 8 females and 6 males, with an average length of illness (onset to death) of 85 days. Only one of the 14 deaths occurred in a patient without neurologic involvement.

A respiratory component (respiratory failure, pneumonia, Adult Respiratory Distress Syndrome) was documented on more than half of all original death certificates submitted. Detailed chart reviews suggest the potential for unrecognized WNV-related respiratory paralysis, a condition first documented in Colorado patients in 2003, <http://www.cdc.gov/ncidod/dvbid/westnile/conf/2005pdf/Sejvar2ndsess.pdf>. Efforts have been made through on-site presentations, mailings and personal consultations to educate clinicians about these unusual syndromes.

### **Conclusion**

During 2003 and 2004, WNV firmly established its presence in the western United States after spreading across the east coast in previous years. Federal, state and local public and veterinary health officials have been joined by vector control, laboratory, research and blood bank agencies in efforts to limit the impact of WNV infection on human populations.

Although development of effective WNV-specific treatment modalities and a human vaccine is slow, major successes have been achieved in laboratory identification and testing, protecting the national blood supply and mosquito control strategies.

There are several factors that suggest this trend may continue in subsequent years: Arizona, geographically, exists along major bird migrations routes and has a human population of more than 3 1/2 million. Arizona also had the second highest WNV-illness count in the nation in 2004 with more than 90% of cases occurring within the boundaries of Maricopa County. Maricopa County is home to all major mosquito species known to transmit WNV to humans. In addition, due to a temperate climate, the mosquito-breeding season can extend for more than 8 months, allowing for significant amplification of WNV circulation.

As a result, it is expected that WNV will become endemic to our region. Strategies to limit human disease include enhanced mosquito surveillance networks, establishment of integrated mosquito control protocols and public information campaigns focusing on behavioral change. Clearly, all plans must have long-term goals to create a permanent infrastructure for WNV prevention in our community.



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**To report communicable diseases, unusual health occurrences, and public health emergencies ( all 602 area codes)**

	<b>Business Hours</b>	<b>After 5p</b>
	<b>M-F 8a—5 p</b>	
Animal bite reports	506-7387	506-7387
Communicable diseases	506-6767	747-7111
Death certificates, Funeral homes, human remains	506-6805	450-9982 ( pager ) or 229-9315 ( pager )
HIV ( reports)	506-6426	Next business day
Public health emergencies	747-7111	747-7111
Rabies	747-7111	747-7111
STDs ( other than HIV )	506-1687	Next business day
TB	506-5065 or 372-1408	747-7111
WNV Hotline	506-0700	506-0700

For change of name or address or to be removed or added to this mailing list, please email Jeannete Gibbon at:  
jeannetegibbon@mail.maricopa.gov or call ( 602 ) 372-2642

